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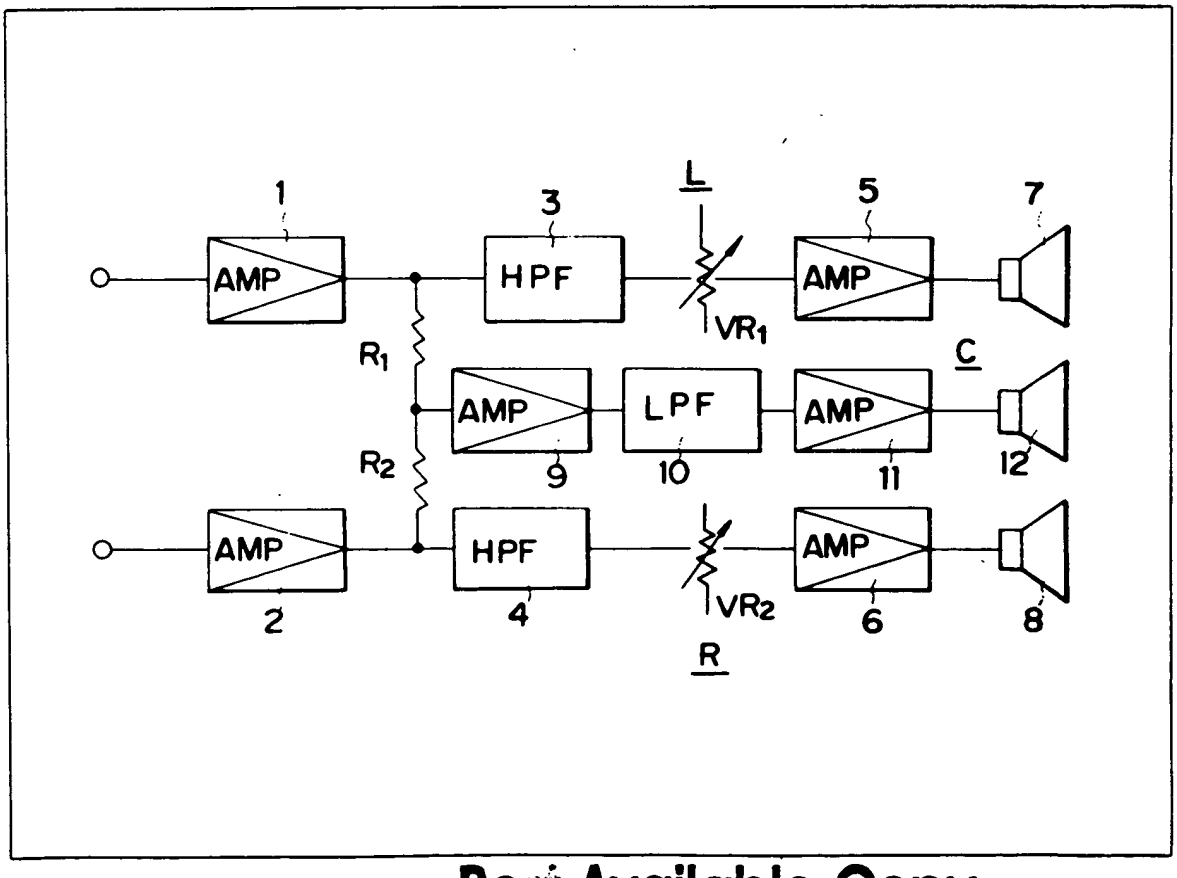
(54) Acoustic apparatus

(57) An acoustic apparatus comprised of a means for extracting middle and high frequency components from left- and right-channel signals through respective high-pass filters 3,4 to reproduce the components, and a means 9 for mixing left- and right-channel signals and extracting a low frequency component through a low-pass filter 10 to reproduce the component, wherein the reproduction power of the middle and high frequency component is set below the reproduction power of the low frequency component.



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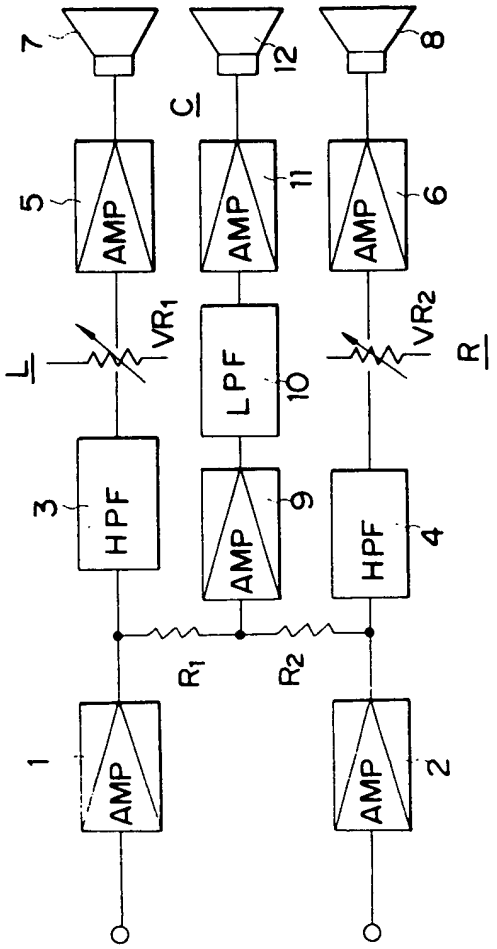

SPECIFICATION

Acoustic apparatus

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an acoustic apparatus, and more particularly to an improvement in a car-acoustic apparatus of three dimension stereo reproducing system.

Description of the Prior Art

The car-acoustic apparatus has been markedly improved to have a high power and high performance so as to reproduce better sound in a living space peculiar to a car and filled with noises generated by the car.

However, since a sound field in the car is closed and masking is caused by various noises, it has been difficult to obtain desired effects. Even if a music is reproduced with high fidelity from loudspeakers, the music is masked by noises such as an engine noise etc. on the way from the speakers to a listener. Thus, it is practically impossible to listen the music under desired conditions because of mixing of the noises with the music. In especial, since the car noises are in a low frequency band, the listener must listen the music without low-frequency components.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an acoustic apparatus which is capable of obviating the disadvantage of the conventional car-acoustic apparatus.

In accordance with the present invention, there is provided an acoustic apparatus which comprises:

a left-channel reproducing means to extract middle and high frequency components from a left-channel signal for reproducing said components;

a right-channel reproducing means to extract middle and high frequency components from a right-channel signal for reproducing said components; and

an intermediate-channel reproducing means for mixing the left- and right-channel signals and extracting a low frequency component from the mixed signal;

a reproduction power of the middle and high frequency components outputted from the left- and right-channel reproducing means being set lower than a reproduction power of the low frequency component outputted from the intermediate channel reproducing means.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing is a block diagram of one embodiment of the present invention.

DESCRIPTION OF THE EMBODIMENT

Referring now to the drawing, there is illustrated an embodiment of the present invention. L is a left-channel reproducing means, R is a right-channel reproducing means, C is an intermediate-channel reproducing means, 1 and 2 are buffer amplifiers, 3 and 4 are high-pass filters, 5 and 6 are power amplifiers, 7 and 8 are loudspeakers, and VR_1 and VR_2 are gain adjusting variable resistors. 9 is an amplifier, 10 is a low-pass filter, 11 is a power amplifier and 12 is a low-frequency loudspeaker.

The buffer amplifiers 1 and 2 effect impedance change of the left- and right-channel reproducing means to prevent possible change of cut-off frequencies of the high-pass filters 3 and 4 due to an influence of signal source impedances coupled to input terminals I_R and I_L. Signals applied to the left- and right-channel reproducing means are supplied to and mixed in the amplifier 9 through resistors R_1 and R_2 to invert phases without deteriorating stereo channel separation. In this case, the low-pass filter and the high-pass filters are so formed that selection of corner frequencies may be effected simply be changing resistances so that the costs of the filters can be curtailed. The variable resistors VR_1 and VR_2 are used to balance the output from the high-pass filters with the output from the low-pass filter.

Thus, only a low-frequency component providing little sense of direction is taken from the left- and right-channels so as to allow it to be reproduced from the low-frequency loudspeaker, i.e., woofer, and the low-frequency component is powered up by the amplifier 11 to reproduce auditorily amended original sound field. The problem caused due to masking of the low-frequency sound can thus be solved. At this time, if the middle and high-frequency components are also powered up as the low-frequency component is powered up, there is provided no desired effect and only the existing sound field is powered up. Therefore, the power of the middle and high-frequency components is suppressed to below, for example, 1/3 of the power of the low-frequency component to provide auditorily balanced reproduction.

The low-frequency component provides no sense of direction as described above, but a sound image is locatable in the living space peculiar to the car, so that the low-frequency loudspeaker 12 is preferably located centrally between the tweeters (loudspeakers 7 and 8). When the sound field is controlled by variable resistors VR_1 and VR_2 of the respective tweeters, desired sound can be easily provided according to the acoustic space.

As apparent from the above description, according to the present invention, the left- and right-channel power amplifiers may be of small power as compared with that of the low-frequency component, so that not only the

safety on the car is increased but the cost can be reduced. In addition, the music can be heard in a balanced state and reproduction of the original sound field can be obtained. Although the high-frequency component has a high directivity and is easy to attenuate, the power thereof is suppressed low as described above, so that it does not strike the listener's ears. And, the power of the low-frequency component surpasses the noises such as the engine noise etc., the music can be heard naturally without causing feeling of fatique.

Furthermore, since frequency division is carried out by filters, the loudspeaker used in another stereo reproduction system can be used, as it is as the tweeter loudspeaker of the present apparatus.

Moreover, when the type of the car to which the apparatus of the present invention is applied is known, the cut-off frequencies of the filters may suitably be determined on the analysis of the characteristic of the car to omit the selecting operation of the filters.

CLAIMS

1. An acoustic apparatus which comprises:

a left-channel reproducing means to extract middle and high frequency components from a left-channel signal for reproducing said components;

a right-channel reproducing means to extract middle and high frequency components from a right-channel signal for reproducing said components; and

an intermediate-channel reproducing means for mixing the left- and right-channel signals and extracting low-frequency component from the mixed signal;

a reproduction power of the middle and high frequency components outputted from the left- and right-channel reproducing means being set lower than a reproduction power of the low frequency component outputted from the intermediate channel reproducing means.

2. An acoustic apparatus according to claim 1, wherein said left- and right-channel reproducing means include high-pass filters, power amplifiers for maplifying the outputs from the respective filters, and speakers adapted to be driven by outputs from the respective amplifiers, respectively.

3. An acoustic apparatus according to claim 2, wherein said intermediate channel reproducing means includes a low-pass filter coupled to the left- and right-channel reproducing means, a power amplifier for amplifying an output from said low-pass filter and a low-frequency speaker adapted to be driven by an output from said amplifier.

4. An acoustic apparatus according to claim 2, wherein each of the left- and right-channel reproducing means includes buffer amplifiers before and after said high-pass filter, respectively.

5. An acoustic apparatus according to claim 1, wherein said reproduction power of the middle and high frequency components outputted by the left- and right-channel reproducing means is set to be 1/3 of that of the low frequency component outputted from the intermediate channel reproducing means.

6. An acoustic apparatus according to claim 1, wherein the left- and right-channel reproducing means and the intermediate channel reproducing means are provided within a room of a car.

7. An acoustic apparatus substantially as herein described with reference to and as shown in the accompanying drawings.

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